Michigan Department of Community Health
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LabLink

Michigan Department of Community Health
Bureau of Laboratories

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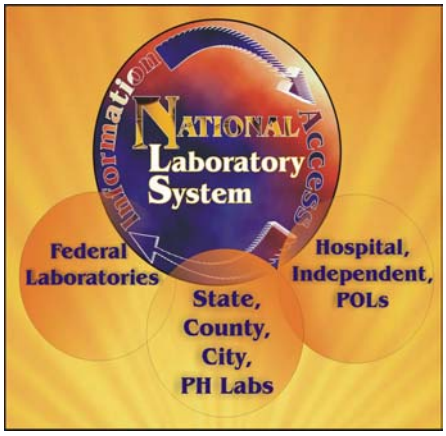
National Laboratory System

Frances Pouch Downes, Dr.P.H.
Laboratory Director

Michigan Department of Community Health Bureau of Laboratories will be one of three demonstration projects funded by the Centers for Disease Control and Prevention (CDC) through an agreement with the Association of Public Health Laboratories (APHL) to develop a National Laboratory System (NLS). The NLS demonstration project represents a unique opportunity to be part of an exciting era of integration of public health and medical care. Michigan clinical and medical laboratories are invited to learn about the NLS and engage in the activities. This initial *LabLink* introduction to the NLS will be followed by subsequent updates to inform the laboratory community about NLS activities and progress.



What is the National Laboratory System?

The NLS describes a cooperative system of public health, hospital and clinical laboratories that address community and public health needs. Envisioned is a Michigan laboratory community, which values the community-based approach for disease prevention and control. It will also recognize the complementary roles of public health, hospital and clinical laboratories in the coordination of activities to assure testing for diseases of public health importance.

A mature laboratory system will be defined by an infrastructure of communications and cooperation, which results in the coordination of private and public laboratory services to detect and respond to public health threats. For example, detection and response to a bioterrorist attack will require that the clinical laboratory was trained to recognize the infectious agent used. The clinical laboratory notifies the public health laboratory of the preliminary results and forwards the suspect isolate to the next response level of public health testing.

Why is a National Laboratory System needed?

Contrary to predictions from the last century, infectious diseases have not been eradicated in the post-antibiotic era. Emerging infectious diseases and foodborne diseases; health risks arising from environmental exposure; bioterrorism; and the role of human genetics in the disease process require maintaining a community-based focus to disease control and prevention. New threats and new laboratory and information technologies make the development of the system more critical than ever. Partnerships and collaboration between laboratories are urgently needed to optimize prevention and control efforts.

Currently there is a loose association of public health and clinical laboratories. Any link between public health programs and clinical laboratories is

largely due to individual collaboration around a single public health issue and is not formalized. The need for a national cohesive system of laboratories has been recommended by the General Accounting Office (Emerging Diseases, 1999), the George Washington University (Notifiable Disease Reporting by Out-of-State Laboratories, 1999) and the Lewin Group (Public Health Laboratories and Health System Change, 1997).

Michigan Demonstration Project

During the two-year demonstration phase of the NLS evolution, MDCH activities will focus on three goals: 1) assuring complete and rapid infectious disease reporting; 2) seamless and expedient testing for diseases and exposures of public health importance; and 3) development of a forum for communications between laboratories and public health programs.

The demonstration project will join resources with another initiative, the National Electronic Data Surveillance System (NEDSS), directed at electronic result reporting from the clinical laboratory to public health programs. Initial assessments and planning for NEDSS will be integrated with the demonstration project to develop electronic standards and identify potential pilot sites for electronic reporting.

Testing for suspected agents of bioterrorism is one public health issue which will require cooperation between clinical laboratories, where the patient specimen is most likely to be initially tested, and public health laboratories, where isolates will be confirmed and disease control activities prompted. The demonstration project will enhance training in identification of bioterrorism agents to clinical laboratories, develop specimen/isolate transport systems and evaluate completeness of reporting and isolate submission. The demonstration project will also provide a forum for laboratorians to identify critical issues like standards of laboratory practice.

The demonstration project will require novel solutions to new and old challenges. The opportunity to be a part of the pilot activities for this national initiative is exciting for MDCH. The evolution and development of the NLS will require sustained and coordinated effort, working with all our current laboratory partners and developing non-traditional partners.

Newborn Lab Back in the Swing After Move

Marilyn Boucher
Newborn Screening

Operations at the newborn screening laboratory are back in a state facility as of March 22. The lab had been leasing space from BioPort Corporation on the site of the old MDPH North Logan complex. According to section manager Harry Hawkins, “After more than six years away from the rest of the bureau, it’s great to share a better building with the other laboratories.”

The newborn laboratory now occupies the basement level of the nearby State Laboratory Building. The lab consists of three main rooms. One room holds the metabolic unit, where testing for Phenylketonuria (PKU), Galactosemia (GAO and GALT) and Maple Syrup Urine Disease (Leucine Deficiency) is performed. The endocrine lab is in the second room where screening for Hypothyroidism (T4 and TSH) and Congenital Adrenal Hyperplasia (CAH) takes place. The last room houses the Sickle Cell lab and the Biotinidase Deficiency test area.

This move provided the newborn screening laboratory with more usable work space and updated facilities for performing the state-mandated testing of more than 130,000 annual infant births, preventing serious mental and/or physical disabilities in Michigan’s babies.

Leadership Investment for Fighting an Epidemic (LIFE)

Frances Pouch Downes, Dr. P.H.
Laboratory Director

The LIFE initiative is a cooperative project targeting those countries hardest hit by the HIV/AIDS epidemic. The Association of Public Health Laboratories (APHL) entered into a cooperative agreement with the CDC Global AIDS Program to work with the countries to strengthen laboratory capacity and develop laboratory systems and integrate them with AIDS prevention programs. Frances Pouch Downes, Laboratory Director, was named APHL country lead for the LIFE activities in Botswana. Dr. Downes traveled to Botswana in February with a team of laboratorians from CDC and APHL and Dr. James Sunstrum of Dearborn, MI, to assess laboratory capacity and make recommendations to the Ministry of Health. The MDCH laboratory team with other public health laboratory partners will continue to provide training and consultation to assist Botswana in providing laboratory support to a population with the highest reported infection rates globally.

West Nile Virus Surveillance, 2001

Duane W. Newton, Ph.D.
Virology Section

With mosquito season approaching, this year's West Nile Virus (WNV) surveillance plan is currently under development. It will supplement the existing Arbovirus Emergency Response Plan. Several agencies have been collaborating on the WNV plan including colleagues in the Michigan Department of Community Health (MDCH) Bureau of Epidemiology and Bureau of Laboratories, Michigan State University (MSU) Department of Entomology and the Animal Health Diagnostic Laboratory (AHDL), Michigan Department of Agriculture (MDA) Animal Industry Division, Laboratory Division and Pesticide and Plant Pest Management Division, and Michigan Department of Natural Resources (DNR) Wildlife Diseases Laboratory. The main components of the plan are listed in Table 1, with the major points of emphasis listed below:

1) A telephone hotline has been established (1-888-668-0869) to provide the following to callers: general information on WNV and other arboviruses; instructions on reporting dead crows; instructions on submission of specimens. The caller will be presented with an option of leaving a message that will be reviewed by one of the agencies of this working group. After reviewing the message, a determination will be made as to the appropriate response (i.e. arrangement for the submission and testing of specimens). A website has been established, (www.mda.state.mi.us/consumer/westnilevirus/) which provides general information on WNV and other arboviruses, as well as links to other sites of interest. It will also provide summary data on specimens that have been tested for WNV.

2) As the WNV outbreak in the eastern United States has centered in urban environments, the areas of intensive surveillance in this state will focus on the lower half of the lower peninsula (Mt. Pleasant and south), with a special emphasis on southeastern Michigan. The most sensitive indicator of WNV activity is the presence of dead crows. The general public is being asked to submit dead "big black birds" for testing. The WNV submission kits are modeled after the rabies kits. WNV specimens will be shipped to MSU's Animal Health Diagnostic Laboratory for testing (prepaid shipping, instructions are included in the kit). WNV kits will be distributed to local health departments and animal control offices but will also be available directly from MDCH. Although not every dead crow will be tested, reporting of dead crows provides important surveillance information. MDCH asks that all dead crow sightings be called in to the WNV hotline.

3) Mosquito surveillance will be expanded to the urban areas of southeast Michigan. Testing of pools for St. Louis encephalitis and Eastern equine encephalitis will be performed at the Laboratory Division of MDA. This is analogous to a surveillance program that has existed for many years in south central and southwest Michigan. Since it has been shown that there is a lag time between the detection of WNV in birds and in mosquitoes, WNV testing of mosquito pools will be undertaken in a concentrated effort only after positive birds have been detected in an area.

4) Active human and horse case surveillance will be conducted by MDCH Bureau of Epidemiology and MDA Animal Industry Division, respectively. Human cases of acute encephalitis with an undetermined etiology will be offered testing for a panel of arboviruses. This testing will occur at the MDCH Bureau of Laboratories. Specimens from suspected horse cases will be tested at the MSU Animal Health Diagnostic Laboratory.

Educational materials are being prepared for distribution. A formal presentation is being developed that would be offered regionally to local agencies either through pre-arranged on-site meetings or conference calls. Details regarding on-site presentations are still being coordinated. To receive a copy of the final plan, call the MDCH Bureau of Laboratories at (517) 335-8067 or the MDCH Bureau of Epidemiology at (517) 335-8165.

Table 1. West Nile Virus Plan Components

Dead crow surveillance
- Reporting of dead crows to WNV hotline
- Testing of crows for WNV at MSU-AHDL

Human case surveillance (acute encephalitis of undetermined etiology)
- Active surveillance by MDCH
- Testing of specimens at MDCH

Equine case surveillance
- Active surveillance by MDA
- Testing of specimens at MSU-AHDL

Mosquito surveillance
- Active surveillance by MDA

MDCH Biological Terrorism Subject Experts Join National Team

Patricia Somsel, Dr. P.H.
Division of Infectious Diseases

Sandip Shah, manager of the reference bacteriology unit, and James Rudrik, Ph.D., laboratory coordinator for bioterrorism preparedness, were invited to Atlanta, GA to meet with subject-matter experts from the CDC, the United States Army Medical Research Institute of Infectious Diseases (USAMRIID), the Federal Bureau of Investigation (FBI) and representatives from seven other states to finalize laboratory protocols to combat bioterrorism. The protocols provide medical and public health laboratories nationwide with standardized procedures to identify bacterial agents that cause anthrax *(Bacillus anthracis),* brucellosis *(Brucella* species), tularemia *(Francisella tularensis),* plague (*Yersinia pestis)* and botulism *(Clostridium botulinum).*

When completed, the protocols will be used nationwide by facilities participating in the Laboratory Response Network for Bioterrorism (LRN). LRN laboratories consist of hospital, clinical, state and regional public health laboratories and the CDC. Hospital clinical laboratories will screen patient specimens for these organisms and refer suspicious isolates to public health facilities for confirmation.

LRN participants in Michigan include approximately 110 hospital clinical laboratories and six regional public health laboratories located in Detroit, Saginaw, Grand Rapids, Kalamazoo and the MDCH laboratories in Houghton and Lansing.

PulseStar Award Goes to MDCH Employee

Jeff Massey, Dr.P.H.
Molecular Biology Section

Steve Dietrich, of the molecular biology section, was one of three laboratorians honored nationwide as a 2001 recipient of the PulseStar Award.

The PulseStar Award is presented annually by the Foodborne and Diarrheal Diseases Laboratory Section (FDDLS) of CDC and the Association of Public Health Laboratories (APHL). The award recognizes PulseNet participants whose efforts have contributed significantly to the advancement of PulseNet activities in public health during the previous year.

PulseNet is a national network of public health department laboratories, the Centers for Disease Control and Prevention (CDC), US Department of Agriculture (USDA) and the Food and Drug Administration (FDA). It was established by CDC to perform standardized DNA fingerprinting on isolates of foodborne bacterial pathogens. The purpose of PulseNet is to rapidly detect outbreaks through surveillance of selected pathogens and to assist in investigations of outbreaks caused by other foodborne bacteria by allowing comparison of isolates from multiple states. Michigan has participated in the PulseNet system since 1998.

Dietrich has performed PFGE analysis since 1989 and has been an integral part of the PulseNet laboratory at MDCH. Because of his expertise in the technical aspects of PFGE testing and image analysis, Michigan was able to rapidly identify and report several outbreaks during the previous year which proved to important to other states. He has maintained an active interaction with CDC and other state laboratories that permits rapid exchange and dissemination of data. Dietrich was specifically recognized for the significant work he performed in drafting a standardized reporting format for summarization of PulseNet data on a quarterly basis.

FUN FUNGI.....

New Mycology References Available

Sandy Arduin & Bruce Palma - Mycobacterium/Mycology Unit

The mycology unit at the Michigan Department of Community Health, Bureau of Laboratories, is in the process of developing a new training tool for laboratory personnel statewide. The unit is creating a digital photo library of mould specimens which have been sent to MDCH for identification. Along with pictures of macroscopic and microscopic morphology is a brief description of salient characteristics of the colonial and microscopic appearance. The library is under construction but those isolates currently catalogued can be shared electronically with those with e-mail access. Recognizing that not all clinical microbiologists in the state have internet access presently, there is potential to utilize this library for onsite training or workshops.

Laboratories desiring a digital photo of a specific mould, or of an isolate submitted to MDCH for identification, e-mail Sandy Arduin at arduins@state.mi.us or Bruce Palma at palmab@state.mi.us . Species, which are not currently available for reference in the MDCH library may be found on the website of Dr. Michael McGinnis at the University of Texas (www.doctorfungus.org). In the future this website will include several photos of unusual moulds taken at MDCH from isolates submitted for identification.

The mycology unit has been sending photos to the Centers of Disease Control to assist in the development of their electronic service for the identification of pathogenic fungi. This CDC service is currently available to those laboratories with the capacity to send electronic images of fungal culture plates and microscopic images of slide cultures or other stained microscopic preparations. The e-mail address for this service is fdx@cdc.gov .

The Bureau of Laboratories is pleased to provide this electronic service to the clinical microbiology community of Michigan. The intention is to extend this reference and training capacity to other areas of clinical microbiology such as parasitology, hoping that this electronic library is a resource that all microbiologists in the state will be able to use in the near future. Since training is an essential component of the MDCH public health responsibility, laboratories are encouraged to share their needs.

The following photos are examples of the library being created at MDCH's mycology unit. For those interested in a quiz, Photo A is the anamorphic (asexual or imperfect) stage of a mould occasionally seen in the lab. Photo B is the teleomorphic (sexual or perfect) stage of the same mould. *LabLink* will provide the answers in the next issue. Future issues of *LabLink* will feature moulds of interest, including those that are difficult to identify or are not commonly seen.

Photo A: Anamorphic State

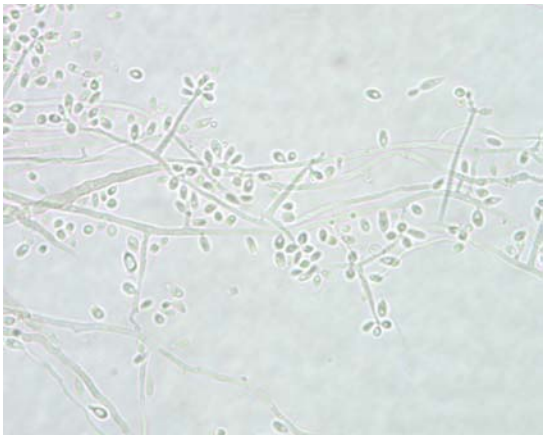
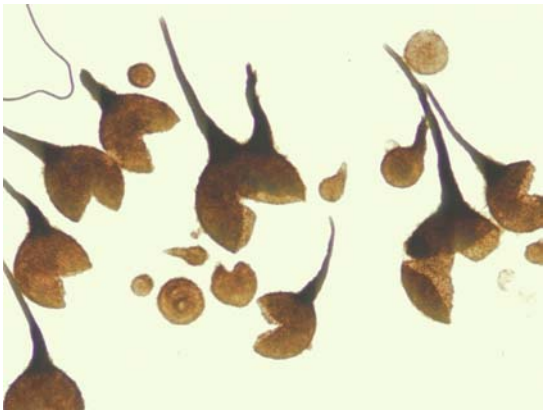


Photo B: Teleomorphic State



Quirky bugs . . .

Robert Jacobson, BS, MT(ASCP)
Reference Bacteriology

Recently, a rare culture isolate was received at MDCH. The submitting laboratory had a tentative identification of *Streptobacillus moniliformis*, based primarily on the gram stain morphology and the patient's history as a pet store owner. The isolate was not viable and no organisms were seen on gram stain from the original submission. The description of the gram stain and its fastidious nature, as described via phone conversations, led to the suspicion of *Capnocytophaga canimorsus* which has been seen at MDCH on several occasions.

A microbiologist from the hospital transported the isolate growing on a plate to the reference bacteriology unit. The gram stain revealed a very pleomorphic gram negative bacillus with bulb shapes. This was consistent with past stains of *C. canimorsus,* but was also similar to reference pictures of *S. moniliformis*. Only one *Streptobacillus* isolate had been received at MDCH in the last eight years. Comparisons of the two isolates could not be done due to lack of biochemical data from the previous isolate.

Small, round, raised, entire, grey colonies grew after four days on five percent sheep blood agar and Columbia agar but not on chocolate or MacConkey agars. This growth pattern was not typical of *C. canimorsus* which grows best on Chocolate agar but poorly on blood agar. The likelihood of *S. moniliformis* was now apparent. *S. moniliformis* requires the addition of ascitic fluid, serum or blood to grow. Identification was determined by morphological characteristics, cellular fatty acid analysis and the biochemical profile.

S. moniliformis is one of the etiological agents of rat-bite fever. The other agent, *Spirillum minus*, is seen mostly in the Far East. This systemic disease is associated with rat bites or direct contact with rodents and their excreta. A food-borne version, Haverhill fever, results from ingesting contaminated food, usually milk. *S. moniliformis* can be transmitted by rodents or rodent ingesting animals. Human to human transmission has not been reported.

Streptobacillary rat-bite fever patients usually present with an abrupt onset of fever, chills, headache and vomiting after an incubation period of less than 10 days (1-22 day range). Relapsing fever occurs in 30 percent of cases. Within days, approximately 50 percent develop migratory polyarthritis and 75 percent develop a macropapular or petechial rash involving the extremities, especially the palms and soles. The fever may resolve within 2-3 weeks or persist for months, if left untreated. The mortality rate for untreated fever is as high as 10 percent. It is difficult to determine the incidence of rat-bite fever because of the difficulties involved in isolating and identifying the etiological agents and the misdiagnosis of the disease.

Although rat-bite fever is associated with low socioeconomic conditions, it has more recently become a risk factor for those handling laboratory rats and mice. More than 50 percent of wild and laboratory rats carry *S. moniliformis* in their nasopharynx. The disease can also be acquired from other rodents, cats, dogs and other carnivores who may feed on them.

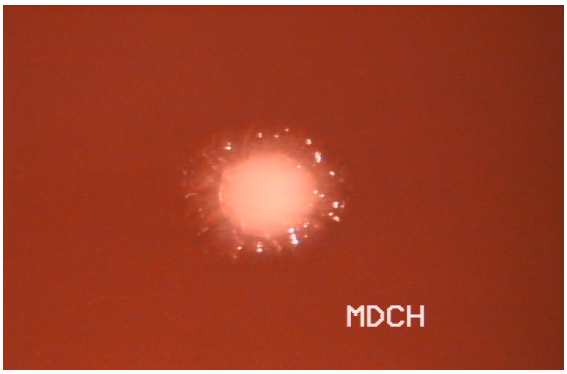
S. moniliformis is a facultatively anaerobic pleomorphic gram negative rod 0.3-0.5Fm in length with very long unbranched filaments. Age, media and growth conditions affect the morphology. Long chains with swellings resembling "strings of beads" can be observed. Reversion to L-forms also occurs. In broth culture *S. moniliformis* will form characteristic "puff balls." This was demonstrated at MDCH by combining several tubes of thioglycolate broth in a larger sterile container and adding rabbit serum to 10 percent final concentration. On solid media after two to six days the colonies are 1-2mm, round, gray, smooth and glistening. L-form colonies are embedded with a fried egg appearance. Frequent subculturing is required to keep the organism viable. This organism forms puff ball growth on the surface of erythrocytes on the bottom of blood culture bottles. The organism is inhibited by sodium polyanetholesulfonate (SPS), so this must be considered when using blood culture systems if rat-bite fever is suspected.

Biochemically, *S. moniliformis* is negative for oxidase, catalase, indole, nitrate reduction and urease. Arginine is hydrolyzed and glucose and maltose are fermented using CTA sugars. Penicillin is the treatment of choice, however, an aminoglycocide must be added to eliminate L-forms.

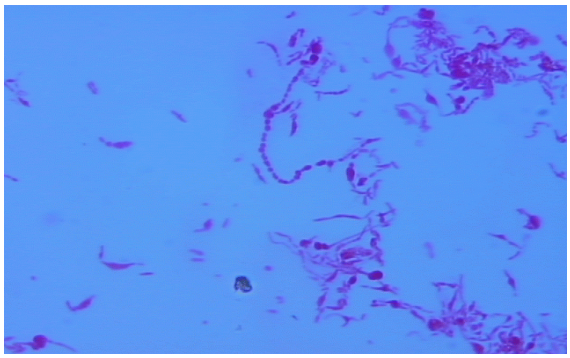
Rat-bite fever may be considered if a patient presents with a fever of unknown origin and a history of rodent exposure or bite can be determined. In this case, many thanks to the Genesys Regional Medical Center of Grand Blanc, for the initial work and for providing the vital information.

References:

1. Josephson, SL. 1988. Rat-bite Fever. pp. 443-447, Laboratory Diagnosis of Infectious Diseases Principles and Practices, vol. 1, Bacterial, Mycotic and Parasitic Diseases. Eds, A Balows, WJ Hausler Jr, EH Lennette. New York: Springer-Verlag.
2. Reinier Mutters 1999. Fastidious gram-negative rods, pp. 568-569. Murray et al, Manual of Clinical Microbiology, 7th ed. American Society for Microbiology, Washington, D. C.



S. moniliformis, single colony on blood agar (BAP)



S. moniliformis, Gram stain, from BAP, 1000x

Michigan Laboratory Response Network

James Rudrik, Ph.D.
Bioterrorism Laboratory Coordinator

Congratulations to the following laboratories for joining the Michigan Laboratory Response Network for Bioterrorism (LRN) and receiving in-service on the agents most likely to be used in a bioterrorist attack.

Regional Medical Laboratory
Oaklawn Hospital
Genesys Regional Medical Center
Garcia Clinical Laboratory
W. A. Foote Memorial Hospital
St. Mary's - Saginaw
McLaren Regional Medical Center
Ingham Regional Medical Center
Saginaw VA Medical Center
Battle Creek VA Medical Center
St. Joseph Mercy Hospital
Memorial Healthcare Center
University of Michigan
Hurley Medical Center
William Beaumont Hospital
Covenant Healthcare
John D. Dingell VA Medical Center
Hospital Consolidated Laboratories
Oakwood Laboratories
St. John Macomb Hospital
North Oakland Medical Centers
St. Mary Mercy Hospital-Grand Rapids
William Beaumont Hospital
Doctors Hospital
Metropolitan Hospital
William Beaumont Hospital Troy
St. Joseph Mercy Hospital Oakland
Hills and Dales Community Hospital
Bi-County Community Hospital
St Mary Mercy Hospital Livonia
United Memorial Hospital
Gratiot Community Hospital
Central Michigan Community Hospital
Mercy General Health Partners
POH Medical Center

Any laboratory providing clinical microbiology services may participate in the LRN. MDCH provides on-site in-service education covering the epidemiology, specimen collection and transport, presumptive identification, and disease states produced by *Bacillus anthracis, Yersinia pestis, Brucella* species, *Francisella tularensis, Clostridium perfringens,* and smallpox. Each participating facility also receives a manual describing procedures for each of these agents. If your facility has not been contacted to schedule training, contact James Rudrik Ph.D. at (517) 335-8183 for further information or to schedule training.

Lyme Disease Testing Reminder

Mary Grace Stobierski, DVM, MPH
Infectious Disease Epidemiology Section

Lyme disease is a reportable disease in Michigan. MDCH performs the following Lyme disease testing free of charge:

1) Serologic testing using the recommended two-step EIA-western blot protocol.

2) Culture of erythema migrans lesions for *Borrelia burgdorferi* from skin biopsy specimen.

3) Tick identification and testing for *Borrelia burgdorferi* on live tick specimens.

These tests can be arranged for any Michigan citizen through their physician.

This year BSK II medium will be distributed on a "call if needed" basis. A standing supply will be kept at regional health department laboratories and at the MDCH laboratory for overnight shipping upon demand.

Upon request, MDCH will supply forms for reporting cases of this disease, microbiology-virology test requisition forms to be returned with a skin biopsy in BSK II medium and/or submitted with serum samples, submission forms for tick identification and information from the Centers for Disease Control and Prevention on the standardized two-step serologic testing for Lyme disease.

To order BSK II medium, please contact Susan Shiflett at (517)335-9763. If you have any epidemiologic questions call Denise Nightingale at (517) 335-9540. Questions pertaining to serologic testing and tick identification can be directed to Dr. Duane Newton at (517)335-8099.

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